

Comments of Laine Adair
Before the
Technical Study Panel on the Utilization of Belt Air
Salt Lake City, UT
May 17, 2007

I am honored today to enter comments before this distinguished panel. I appreciate the time that the panel took on Tuesday to tour the Skyline Mine and the Aberdeen Mine as part of your study. The lessons that you learned at these two operations will, I believe, assist you greatly in the performance of your assigned duties.

My name is Laine Adair and I am the General Manager of UtahAmerican Energy. In that capacity I have operational oversight for the three operating mines of UtahAmerican: West Ridge, Aberdeen and Crandall Canyon, in addition to oversight for other properties and leases that we control. Our operations currently produce about seven million tons per year of high quality bituminous coal. I started working in the coal mines in Carbon and Emery Counties in 1974.

My comments today will follow very closely the presentation that I gave to the panel prior to the underground tour of the Aberdeen Mine that we conducted Tuesday afternoon. I will talk about the rich and long coal mining history in Utah, the lessons learned over many, many years through technical studies combined with trial-and-error and how we have arrived at the methods used to conduct the present day two-entry operations in our state.

The coal deposits of the Wasatch Plateau and Bookcliff areas in Utah have been described as being in the shape of a large fish hook. The coal deposits, and also the significant natural gas and oil deposits in the area, were laid down by the advancing and retreating shoreline of an inland seaway that covered what is now the Great Plains region of the United States during the Cretaceous Age. This made for a thick sequence of alternating massive beach sand deposits and swamp deposits rich in organic material from which reserves of coal, oil and gas have been exploited for many decades.

The sequence of layers is depicted in the accompanying Generalized Section of Blackhawk Formation in Deadman Canyon (attached as Figure 1), and is displayed in the photographs attached. These include:

- Figure 2 – photograph of 1960's Hwy 6 road cut at Castlegate showing coal seams and overlying sandstones,
- Figure 3 – photograph of Castlegate sandstone along Hwy 191 behind Western Energy Training Center (old Willow Creek Mine site),
- Figure 4 – photograph of cliff-forming beach sequences at West Ridge Mine loadout, and
- Figure 5 – photograph of small sandstone channel scour in highwall at Aberdeen Mine portal area.

Wasatch and Bookcliff Coal fields

The present day Wasatch and Bookcliff coal fields are characterized by mountainous terrain and steep incised canyons. This is due to the massive sandstone and siltstone cliff forming members that were deposited by the inland seaway. Several major coal seams sit directly top of and are spread throughout these massive beach sandstones. The sandstones characteristically have poorly defined and widely spaced joint patterns. This results in massive blocks with poor caving characteristics which makes wonderful road cuts, but is not conducive to good longwall mining.

Longwall gob areas produce low to negative angles of draw ranging from minus 15 degrees to positive 25 degrees. Our mining blocks are also criss-crossed by major sandstone channels, a result of the ever-changing rivers and streams that flowed through the Cretaceous swamps. We also contend with rolls, deep cover (up to 3,000 feet), large displacement faults, strong brittle coal, and multiple seam mining (with as many as six mined seams overlain in one area). The coal deposits of the Wasatch and Bookcliff tend to be lenticular in nature which gives geologists fits in identifying and correlating seams.

The Wasatch coal field, on the western side of the deposits, is generally flat lying with in-mine grades of zero to 10 percent. The Wasatch mines are non-gassy.

The Bookcliff coal field, on the eastern side of the deposits, generally has steep grades of 10 to 22 percent. These mines are gassy. The depositional features of the Wasatch and Bookcliff contribute to the bounce-prone nature of the reserves.

Mining History

Organized mining started in the Wasatch and Bookcliff coal fields in the early 1880's. These are drift mines with the cover increasing as mines develop into the mountain. Early mining progressed to depths of about 1,500 feet where ground conditions and ventilation capacity halted mining operations. Second-mining generally ended at depths of 1,000 to 1,500 feet due to bounces. Some mines were able to first-mine to depths of greater than 2,000 feet.

Mining experience demonstrated that the best control of ground conditions required the use of narrow entry widths, a minimum number of entries, large stiff pillars in main entries and small yield pillars in areas of second-mining. But this mine design had limitations and each mining operation was eventually plagued with major ground control problems which closed the mine.

In 1962 the Kaiser Steel Sunnyside Mine started the second longwall operation used in the United States in an attempt to mine the deeper cover reserves on their property. Longwall mining was brought to the Sunnyside Mine by the legendary John Peperakis who spent his military service during World War II touring the longwall coal mines of England and eventually Germany. Mr. Peperakis brought longwall technology to the Sunnyside Mine following the war.

The Sunnyside Mine started longwall mining using two-entry yield pillars as gate roads based on past experience gained in ground control in their own mine and at other mines in the area. The ventilation and roof control plans for the Sunnyside longwall operation were approved through the appropriate federal and state agencies.

The Sunnyside Mine, in conjunction with the Bureau of Mines and other ground control experts, experimented with various yield pillar sizes to minimize gate road pillar bounces. They ended up with a yield pillar 30 feet wide that best suited the conditions at the Sunnyside Mine. In the late 1970's single longwall gate roads were developed in two panels to eliminate pillars and associated pillar bounces in the gate roads. However, the required 25-foot entry width of the single entry gate road proved unstable and the mine reverted back to the two-entry yield pillar system. Using this design the Sunnyside mine was successful in extracting 41 longwall panels from 1962 to 1992 at depths up to 2,900 feet of cover. In 1992, due to the size of the mine workings and the inability to compete with modern mines, the Sunnyside Mine closed after more than 100 years of operation.

Based on the success with longwall mining at the Sunnyside Mine, other companies operating in the Wasatch and Bookcliff coal fields started evaluating longwall mining at their operations. The major concern for the longwall design was ground control. Experts such as the Bureau of Mines, Charles Holland, Arthur Wilson, the National Coal Board of Great Britain and others were consulted to provide the best design of longwall gate roads to minimize pillar bounces. Many variations of three-entry designs were evaluated, ranging from large 220-foot by 220-foot stiff pillars to a combination stiff / yield systems and small 30-foot by 120-foot yield / yield pillar systems. The final conclusion was that the two-entry yield pillar system pioneered at the Sunnyside Mine was the best overall system for ground control. However, the federal and state regulatory agencies responsible for approval of mine ventilation and roof control plans required that each mine demonstrate that a three-entry system could not be used before they would approve the use of a two-entry system.

In 1976, the second longwall operation in the area was started at the Braztah No. 3 Mine in the Bookcliff coal field. Other mines in the area soon followed with longwall operations. The mines generally started using three-entry yield pillar designs with various pillar widths based on advice from ground control experts and the conditions at each mine. Typically, after several panels it was demonstrated that the three-entry system was plagued with major ground control problems associated with pillar bounces, excessive convergence, floor heave, roof failures exasperated by four-way intersections and major restrictions to ventilation and escape ways caused by adverse ground conditions. One-by-one the mines were allowed, through approval of their ventilation and roof control plans, to experiment with two-entry yield pillar systems. In each case it was demonstrated that the use of the two-entry yield pillar system considerably improved overall ground control, entries stayed open and bounces were significantly reduced. This also resulted in improved ventilation and more stable escape ways. See Figures 6 and 7, mine maps of Braztah No. 3 Mine Sub-3 Seam and Plateau Starpoint No. 2 Mine Wattis Seam, respectively.

On December 19, 1984, in the Wilburg Mine located in the Wasatch coal field, a fire was started by an over-heated compressor. The Wilburg Mine was using a two-entry yield pillar longwall gate road system at the time of the fire. A major investigation into the fire and the resulting deaths was undertaken by the associated regulatory agencies. A special two-entry task force was put in place, and the safe use of two-entry longwall gate road systems was evaluated thoroughly.

Immediately following the Wilburg Mine fire, all mines using two-entry longwall gate road systems in Utah were required to apply for "interim relief" with the federal Mine Safety and Health Administration (MSHA) to continue the operation of the mines while the investigations were conducted. It was also determined that the use of two-entry longwall gate road systems could not be approved through the normal approval process of the mine ventilation and roof control plans and that the 101(c) Petition for Modification process would have to be used.

The final report of the two-entry task force recommended that the use of the two-entry longwall gate road system with the addition of several recommendations by the task force provided the safest overall design for the longwalls in the Wasatch and Bookcliff coal fields. The primary recommendation by the task force was the use of "extensive environmental monitoring systems for early fire warning."

Following the final report by the two-entry task force, each two-entry longwall mine in the Wasatch and Bookcliff coal fields, one-by-one, incorporated the task force recommendations into 101(c) Petitions and continued the use of two-entry longwall gate road systems. As new mines have opened in the area they have had to demonstrate the need for the use of two-entry longwall gate road systems and apply for, and receive, approved 101(c) Petitions before being allowed to use two-entry systems.

The successful use of the two-entry system for longwall gate road entries and the corresponding use of belt entries as return (on development) and intake (on retreat) airways in the Wasatch and Bookcliff coal fields since 1962 was influential in the development of the rules governing the use of belt air covered under CFR 75.350.

Benefits of Using Belt Air

With the use of three-entry longwall gate roads, the ground conditions in the longwall gate road entries were so severely restricted by supplemental roof and rib support, cave-ins, floor heave and rib sloughage that ventilation was severely restricted and escape ways were compromised. The improved ground conditions provided by two-entry longwall gate road systems significantly improved ventilation and escape ways. However, due to the minimal number of entries, ventilation resistance is still high and requires the use of a high pressure ventilation system. The use of belt air to provide additional intake air to the longwall face and bleeder system is of great importance to the overall ventilation system and mine safety.

The UtahAmerican Energy Inc. Aberdeen Mine presently produces 7,000 tons per day, or 2,000,000 tons per year, and liberates 11 million cubic feet of methane per day. Presently

65 percent of the methane from the active longwall panel is removed from the mine directly to the surface through vertical methane drainage holes and 35% of the methane is removed by the bleeder ventilation system. Recently the ventilation system was upgraded from an exhausting ventilation system to a push / pull ventilation system with the installation of a new intake ventilation shaft and blowing fan costing nearly \$1,500,000. With this ventilation system upgrade, when the longwall starts mining on the next longwall panel (Panel No. 10) the ventilation available to the longwall face will be 140,000 cubic feet per minute and one-inch water gauge pressure using the belt air as an intake. If the belt entry had to be used as a return, the ventilation available to the longwall face would be 98,000 cubic feet per minute and one half-inch water gauge pressure – an almost 43% increase in the volume of air. If we had not performed the system upgrade with the new fan and shaft, the ventilation available to the longwall face would have been 119,000 cubic feet per minute and 0.71-inches water gauge pressure using the belt air as an intake, and the ventilation available to the longwall face would have been only 83,000 cubic feet per minute and 0.34-inches water gauge pressure if the belt line had to be used as a return. This information is summarized in the table below:

**Tower Mine Longwall Panel 10
Effect of Utilizing Belt Air Before & After Ventilation Upgrade**

Case	Belt Air	Fan Upgrade	Air Available at Headgate (cfm)	Percent Increase with Belt Air	Diagonal Pressure at HG (inches w.g.)
a	X	X	140,000	42.9%	0.98
b		X	98,000		0.48
c	X		119,000	43.4%	0.71
d			83,000		0.34

The sketches attached as Figures 8 and 9, show these scenarios in a simple VnetPC format. It can clearly be seen how important the use of the belt as an additional intake is to the ventilation of the longwall face and bleeder system at the Aberdeen Mine. The use of the additional intake air provided by the belt as an intake with the recent ventilation upgrade allows us to operate the Aberdeen Mine in a much safer overall condition.

Safety Measures Associated with the Use of Belt Air

Enough cannot be said about the ability of Atmospheric Monitoring Systems to improve the safety of underground coal mines. AMS systems have become very accurate and dependable in early detection and sounding of the alarm to miners of fires before the fire gets started. Often elevated levels of CO are detected and the problem is investigated and corrected while the event is nothing more than elevated temperatures. Wendell Christensen, who oversees the atmospheric monitoring systems at all of UEI's mines, will present comments regarding modern, sophisticated AMS systems.

The use of the belt as an additional intake to the longwall face also provides an improved level of protection for worker safety. If a fire starts in by the belt point feed at the mouth of the section, all a miner has to do is move to the adjacent entry to get into a safe

environment and escape. This was one of the recommendations of the two-entry task force and is a requirement of the two-entry petition.

If a fire starts in the main intakes, and the belt line is used as a return, as soon as smoke reaches the longwall face it will also be traveling down the beltline making it no less hazardous than the intake entry. However, with the use of an AMS system as required by the use of belt air at the face, the existence of CO in the intake air would be detected and the mining crew would receive advanced warning and would be evacuated.

Summary

Utah has a long and proud history of coal mining, especially as it relates to longwalls. Utah was a pioneer in the development of safe and productive longwall mining in this country despite having to battle severe conditions that make any type of secondary mining extremely difficult.

The use of two-entry development and the use of belt air at the longwall face is required today to safely mine in many of Utah's longwall mines. I am pleased with the panel taking the time to understand the unique situations we have here in Utah, and I am confident that you will take our needs into consideration in your final report.